

THIRD SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2023

(Regular/Improvement/Supplementary)

PHYSICS

GPHY3B03T: ELECTRODYNAMICS - I

Time: 2 Hours

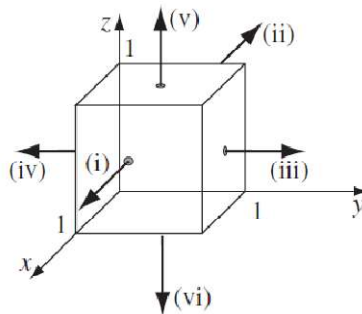
Maximum Marks: 60

**SECTION A: Answer the following questions. Each carries *two* marks.
(Ceiling 20 Marks)**

1. State Ampere's circuital theorem.
2. What is the geometrical interpretation of curl of a vector function?
3. Write down the expression for electrostatic energy in dielectric medium and explain the symbols.
4. Define the surface-bound charge density. How is it related to polarization vector?
5. Show that Coulomb's law of electrostatic force obeys Newton's third law of motion.
6. What is a polar molecule? Give an example.
7. Give the basic features of one dimensional Dirac Delta function.
8. What is a capacitor? Explain its principle.
9. Obtain Poisson's equation from differential form of Gauss's law.
10. What are diamagnetic materials? Give two properties of them.
11. Distinguish between permeability and permittivity.
12. Write down the relation between electric susceptibility and dielectric constant.

**SECTION B: Answer the following questions. Each carries *five* marks.
(Ceiling 30 Marks)**

13. Explain the cyclotron motion and obtain cyclotron formula.
14. Check the divergence theorem using the function $\vec{v} = y^2\hat{x} + (2xy + z^2)\hat{y} + (2yz)\hat{z}$ and the unit cube situated at the origin.



(PTO)

15. Find the magnetic field a distance z above the center of a circular loop of radius R , which carries a steady current I .
16. Derive the expression for the force experienced by the dielectric in an electric field.
17. Obtain the expression for energy stored in a charged capacitor.
18. Derive the magnetostatic boundary conditions.
19. Find an expression for the volume of a sphere of radius R using the spherical polar coordinate system.

SECTION C: Answer any *one* question. Each carries *ten* marks.

20. What is magnetization? Derive an expression for the magnetic vector potential due to a magnetized material in terms of bound currents.
21. State and prove Gauss's law in electrostatics. Use Gauss's law to find the electric field inside and outside a spherical shell of radius R , which carries a uniform charge density σ .

(1x 10 = 10 Marks)